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(71) Applicant (for all designated States except US): **THE PROCTER & GAMBLE COMPANY** [US/US]; One Procter & Gamble Plaza, Cincinnati, OH 45202 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **KOMURE, Natsumi** [JP/JP]; 4-12-404, Narihira-cho, Ashiya-shi, 659-0068 (JP). **SNYDER, Michael, Albert** [US/JP]; 5-15-701 Koyo-cho Naka, Higashinada-ku, 658-0032 (JP).

(74) Common Representative: **THE PROCTER & GAMBLE COMPANY**; Reed, T., David, 5299 Spring Grove Avenue, Cincinnati, OH 45217 (US).

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(54) Title: **CONCENTRATED HAIR CONDITIONING COMPOSITION**

(57) Abstract: Disclosed is a concentrated hair conditioning composition for preparing a treated water having a silicone conditioning agent concentration of 0.001% to 2% for applying to the hair comprising: from about 0.01% to about 20% by weight of a silicone conditioning agent; and an aqueous carrier; wherein the composition is capable of providing a deposition of from about 10ppm to about 5000ppm of silicone conditioning agent when applied to the hair as the treated water.

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CONCENTRATED HAIR CONDITIONING COMPOSITION

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FIELD OF THE INVENTION

The present invention relates to concentrated hair conditioning compositions comprising a silicone conditioning agent which deposits well on the hair and delivers hair conditioning benefit to the hair by dispersing the composition to the rinse water and rinsing the hair with such treated rinse water.

BACKGROUND

Human hair becomes soiled due to its contact with the surrounding environment and from the sebum secreted by the scalp. The soiling of hair causes it to have a dirty feel and an unattractive appearance. The soiling of the hair necessitates shampooing with frequent regularity.

Shampooing cleans the hair by removing excess soil and sebum. However, shampooing can leave the hair in a wet, tangled, and generally unmanageable state. Once the hair dries, it is often left in a dry, rough, lusterless, or frizzy condition due to removal of the hair's natural oils and other natural hair conditioning and moisturizing components. The hair can further be left with increased levels of static upon drying, which can interfere with combing and result in a condition commonly referred to as "fly-away hair", or contribute to an undesirable phenomena of "split ends", particularly for long hair.

A variety of approaches have been developed to alleviate these after-shampoo problems. These approaches range from post-shampoo application of hair conditioners such as leave-on and rinse-off products, to hair conditioning shampoos which attempt to both clean and condition the hair from a single product.

Although some consumers prefer the ease and convenience of a shampoo which includes conditioners, a substantial proportion of consumers prefer the more conventional conditioner formulations which are applied to the hair as a separate step from shampooing, usually subsequent to shampooing. The

conditioning formulations thus applied to the hair would then typically be rinsed off from the hair, and the hair would be left to dry.

In order to meet the needs of consumers living in locations where water supply is unstable and thereby desiring conditioning benefit to the hair without using water excess to the amount that would be used for shampooing the hair, a concentrated hair conditioning composition and its method of use was proposed in co-pending PCT application PCT/US00/24973. Such concentrated hair conditioning composition is used for conditioning the hair by: providing a treated water by dispersing the concentrated hair conditioning composition to water in, for example, a basin and/or scoop; and rinsing the hair with the treated water. In view of such method of use, good dispersing properties upon contact with water is desired for concentrated hair conditioning compositions. Yet, consumers do not wish to compromise on conditioning performance for good dispersing properties. A conditioning agent that has good deposition on the hair is desired for such method of use.

Based on the foregoing, there remains a desire to provide concentrated hair conditioning compositions which, when applied to the hair as treated water, provide good deposition on the hair, thereby providing hair conditioning benefits such as smooth feel when the hair is wet, combing ease when the hair is wet or dry, and softness when the hair is dry. There is also a desire to provide such hair conditioning compositions which disperse easily upon contact with water.

None of the existing art provides all of the advantages and benefits of the present invention.

SUMMARY

The present invention is directed to a concentrated hair conditioning composition for preparing a treated water having a silicone conditioning agent concentration of 0.001% to 2% for applying to the hair comprising:

- (1) from about 0.01% to about 20% by weight of a silicone conditioning agent; and
- (2) an aqueous carrier;

wherein the composition is capable of providing a deposition of from about 10ppm to about 5000ppm of silicone conditioning agent when applied to the hair as the treated water.

These and other features; aspects, and advantages of the present invention will become evident to those skilled in the art from a reading of the

present disclosure.

DEFINITIONS

Herein, "comprising" means that other steps and other ingredients which do not affect the end result can be added. This term encompasses the terms "consisting of" and "consisting essentially of".

5 All percentages, parts and ratios are based upon the total weight of the compositions of the present invention, unless otherwise specified. All such weights as they pertain to listed ingredients are based on the active level and, therefore, do not include carriers or by-products that may be included in commercially available materials.

10 Herein, "treated water" means the water to which the silicone conditioning agent of the concentrated hair conditioning composition of the present invention is dispersed, the treated water having a concentration of 0.001% to 2% of the silicone conditioning agent.

Herein, "deposition" means the weight ratio (ppm) of a silicone conditioning agent deposited on a hair sample calculated according to the following: Measurement is made by immersing a measured weight of hair in a treated water containing a measured concentration of the silicone conditioning agent, wherein such concentration is controlled to be between 0.001% to 2%; and analyzing such treated hair for silicon content as a surrogate for the silicone conditioning agent via Inductively Coupled Plasma - Atomic Emission Spectroscopy (ICP-AES); The ICP-AES analysis is conducted using the SPS4000 system available from Seiko Corporation. A response factor obtained by measuring the standard silicone conditioning agent solution is introduced.

15 Herein, "dispersible" with regard to the conditioning composition, silicone conditioning agent, or additional conditioning agent, means being capable of providing homogenous treated water when released in water and mixed by hand for no more than 30 seconds, and "dispersability" means such ability.

20 Herein, "transparent" with regard to the conditioning composition, prior to dispersing in water, means having a turbidity of no more than about 200 NTU (Nephelometric Turbidity Units). Herein, "transparent" with regard to the treated water means being homogeneous, and having a turbidity of no more than about 100 NTU. The NTU values are measured using the Hach 2100N Laboratory Turbidimeter calibrated with Formazin standards, available from Hach Company.

DETAILED DESCRIPTION

While the specification concludes with claims which particularly point out and distinctly claim the invention, it is believed the present invention will be better understood from the following description.

All cited references are incorporated herein by reference in their entireties.

- 5 Citation of any reference is not an admission regarding any determination as to its availability as prior art to the claimed invention.

METHOD OF CONDITIONING AND PRODUCT FORM

The present invention is directed to a concentrated hair conditioning composition which is used by a method comprising the steps of:

- 10 (a) providing a treated water by dispersing the conditioning composition to water, wherein the treated water has a concentration by weight of from 0.001% to 2% of the silicone conditioning agent; and
(b) rinsing the hair with the treated water.

15 In the method of the present invention, the concentrated hair conditioning composition is dispersed in water, and the treated water thus obtained is applied to the hair. The term "treated water" is defined under the Definitions Section above. This term as used herein describes water provided by the user and to which at least the conditioning composition is dispersed, and in addition, optionally other components such as rinse aid systems are dispersed in the same
20 water. Such treated water is applied to dry or wet hair for providing conditioning benefit to the hair. The treated water can be made in a basin and/or scoop, or any other convenient vessel, typically a basin and/or scoop available in the user's home.

25 In one preferred embodiment, the concentrated hair conditioning composition is used by a method comprising the steps of:

- (a) applying a shampoo composition comprising a deterative surfactant to the hair;
(b) providing a treated water by dispersing the conditioning composition to water, wherein the treated water has a concentration by weight of from 0.001% to
30 2% of the silicone conditioning agent; and
(c) rinsing the hair with the treated water.

Steps (a) and (b) can be reversed. In this embodiment, the treated water is applied to the hair after a shampoo composition comprising a deterative surfactant is applied and worked through the hair. Thus, rinsing the hair with
35 treated water provides two functions at the same time, namely, it washes away

the shampoo composition and soils from the hair while also providing conditioning benefit to the hair. This allows the user to provide conditioning benefits to the hair without using water excess to the amount that would be used for shampooing the hair.

5 The shampoo composition to be used in step (a) can be any composition comprising deterative surfactants and is suitable for washing off soils from the hair. The term deterative surfactant, as used herein, is intended to distinguish these surfactants from surfactants which are primarily emulsifying surfactants, i.e. surfactants which provide an emulsifying benefit and which have low cleansing
10 performance. It is recognized that most surfactants have both deterative and emulsifying properties. It is not intended to exclude emulsifying surfactants from the present invention, provided the surfactant also possesses sufficient deterative properties to be useful herein. Deterative surfactants are typically selected from the group consisting of anionic surfactants, amphoteric surfactants, nonionic
15 surfactants, and mixtures thereof. In one preferred embodiment, at least an anionic surfactant is included in the shampoo composition to be used in step (a).

 The present invention is also directed to a method of purifying water for applying to the hair comprising the step of adding a rinse aid system to the water. It has been surprisingly found that, when the pre-purified water contains a high
20 amount of heavy metal ions and salts, the purified water obtained by the method herein can provide benefit to the hair when applied, such as soft feel to the hair, even without any hair conditioning agents, as compared to the pre-purified water. The rinse aid system for purifying water is preferably included in the concentrated hair conditioning composition.

25 For providing a conditioning benefit to the hair while not negatively affecting the rinsing ability of the shampoo composition and soils from the hair, the treated water has a concentration by weight of from 0.001% to 2%, preferably from about 0.001% to about 0.5% of silicone conditioning agent. In order for the user to achieve this suitable concentration of treated water, the conditioning
30 composition of the present invention may be provided in a package means containing a unit dose of the conditioning composition, or with a measuring means. The dosage of the composition is determined based on the amount of water contained in an average size vessel provided by the user, for example a basin and/or scoop, for making the treated water.

35 The conditioning composition of the present invention can be provided in

any form which is suitable for transportation and storage at ambient temperatures, and is readily applicable to the water upon use to make the treated water. As the conditioning composition is designed to readily disperse in water, the composition is typically easily degraded by humidity. Packaging for any product form is selected to avoid humidity and preferably, accidental contact with water.

The conditioning composition of the present invention is in the form of a liquid such as a gel or paste, the carrier being aqueous. Suitable packaging for such product form include sachets, or constructed packaging having one or more compartments.

SILICONE CONDITIONING AGENT

The present composition comprises from about 0.01% to about 20%, preferably from about 0.5% to about 5% of a silicone conditioning agent. The silicone conditioning agents useful herein include those which are capable of providing a deposition of from about 10ppm to about 5000ppm, preferably from about 20ppm to about 500ppm, when applied to the hair as the treated water. The term "deposition" is defined in the Definitions Section above. Of notice is that the deposition measurement is conducted using the treated water having a measured concentration of the silicone conditioning agent, wherein such concentration is controlled to be between 0.001% to 2%. The conditioning composition for making such treated water may contain additional conditioning agents and other components. Such additional conditioning agents and other components may or may not affect the deposition of the silicone conditioning agents. The level and species of the silicone conditioning agent is selected so that the given deposition is achieved, in consideration of the influence of such additional conditioning agents and other components. Without being bound by theory, it is believed that, by having a controlled level of deposition on the hair, hair conditioning benefits such as smooth feel when the hair is wet, combing ease when the hair is wet or dry, and softness when the hair is dry can be provided, while still providing good dispersability upon making the treated water. Preferred are silicone conditioning agents which are also dispersible upon making the treated water. The term "dispersible" is defined in the Definitions Section above.

The silicone conditioning agents useful herein include hydrophilically substituted silicone conditioning agents. The silicone conditioning agents for use

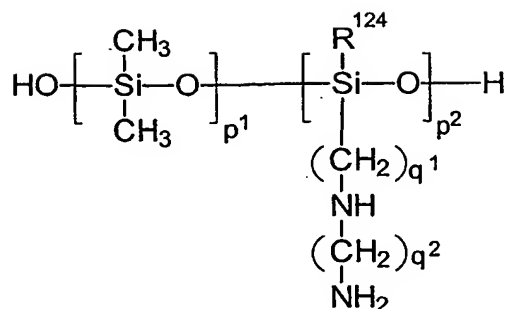
herein will preferably have a viscosity of less than about 5,000 mPa·s at 25 °C, more preferably less than about 1,000 mPa·s at 25°C. The viscosity can be measured by means of a glass capillary viscometer as set forth in Dow Corning Corporate Test Method CTM0004, July 20, 1970. Other nonvolatile silicone conditioning agents having hair conditioning properties can also be used. Without being bound by theory, silicone conditioning agents having lower viscosities are believed to provide faster dispersion when in contact with water. Silicone conditioning agents having no hydrophilic functionality and/or viscosities of over 5,000 mPa·s at 25 °C can be used, although are preferably kept to a small amount, as they tend to make the composition less dispersible.

Particularly preferred silicone conditioning agents herein are those having substitute groups selected from the group consisting of alkoxy groups, amino groups, quaternary amino groups, and mixtures thereof. Silicone conditioning agents having alkoxy groups such as ethylene oxide groups are preferred as they are easily dispersed in water, and provide good transparency to the treated water. Silicone conditioning agents having amino groups and/or quaternary amino groups are preferred as they have good solubility, and also provide good conditioning performance as being substantive to the hair surface.

In one embodiment, the silicone conditioning agents provide a transparent conditioning composition, as well as a transparent treated water. The term "transparent" is defined in the Definitions Section above.

The hydrophilically substituted silicone conditioning agents that can be used include, for example, a polyethylene oxide modified polydimethylsiloxane although mixtures of ethylene oxide and propylene oxide can also be used. The polypropylene oxide level should be sufficiently low so as not to interfere with the dispersability characteristics of the silicone. These materials are also known as dimethicone copolyols. These materials can be directly dispersed in water.

Other hydrophilically substituted silicone conditioning agents include amino substituted materials. Suitable alkylamino substituted silicone conditioning agents include those represented by the following structure (II)

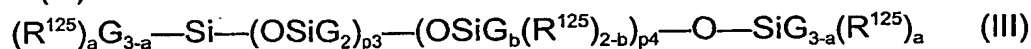


(II)

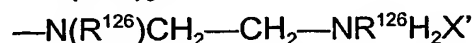
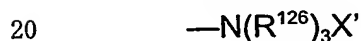
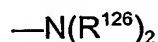
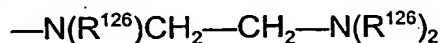
wherein R^{124} is H, CH_3 or OH, p^1 , p^2 , q^1 and q^2 are integers which depend on the molecular weight, the weight average molecular weight being approximately between 5,000 and 10,000. This polymer is also known as "amodimethicone".

5 These Amodimethicones are available, for example, from Dow Corning as SM8704C.

Suitable amino substituted silicone fluids include those represented by the formula (III)



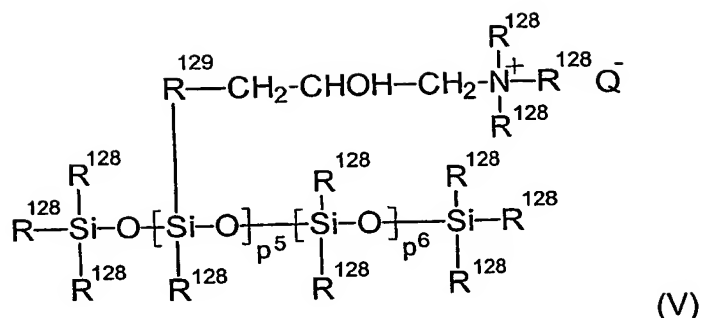
10 in which G is chosen from the group consisting of hydrogen, phenyl, OH, $\text{C}_1\text{--C}_8$ alkyl and preferably methyl; a denotes 0 or an integer from 1 to 3, and preferably equals 0; b denotes 0 or 1 and preferably equals 1; the sum p^3+p^4 is a number from 1 to 2,000 and preferably from 50 to 150, p^3 being able to denote a number from 0 to 1,999 and preferably from 49 to 149 and p^4 being able to denote an integer from 1 to 2,000 and preferably from 1 to 10; R^{125} is a monovalent radical of formula $\text{C}_{q^3}\text{H}_{2q^3}\text{L}$ in which q^3 is an integer from 2 to 8 and L is chosen from the groups



in which R^{126} is chosen from the group consisting of hydrogen, phenyl, benzyl, a saturated hydrocarbon radical, preferably an alkyl radical containing from 1 to 20 carbon atoms, and X' denotes a halide ion.

25 An especially preferred amino substituted silicone corresponding to formula (III) is the polymer known as "trimethylsilylamodimethicone" wherein R^{124} is CH_3 .

Other amino substituted silicone polymers useful herein include cationic amino substituted silicones represented by the formula (V):



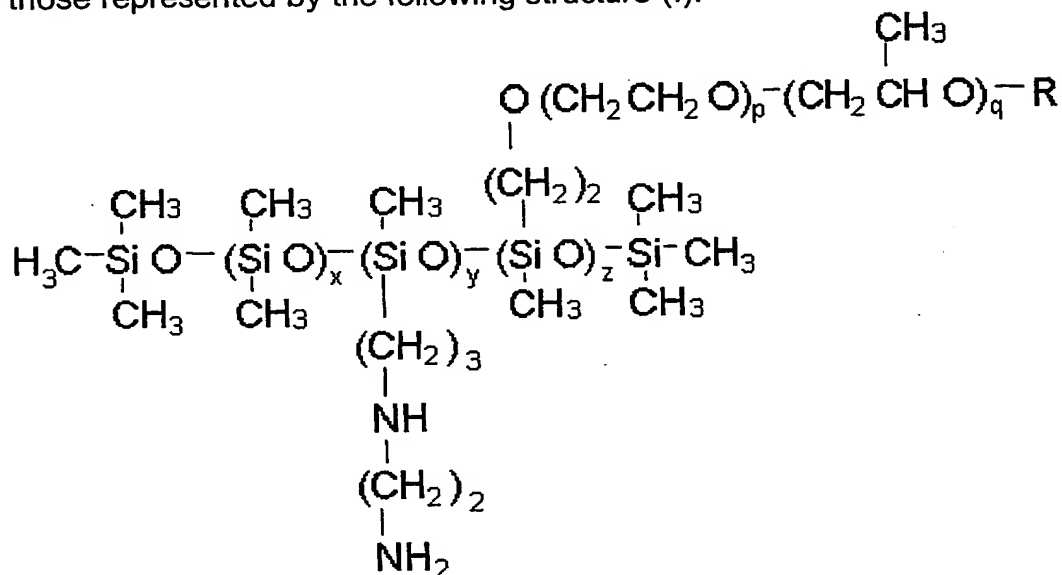
where R^{128} denotes a monovalent hydrocarbon radical having from 1 to 18 carbon atoms, preferably an alkyl or alkenyl radical such as methyl; R^{129} denotes a hydrocarbon radical, preferably a C_1 - C_{18} alkylene radical or a C_1 - C_{18} , and more preferably C_1 - C_8 , alkyleneoxy radical; Q^- is a halide ion, preferably chloride; p^5 denotes an average statistical value from 2 to 20, preferably from 2 to 8; p^6 denotes an average statistical value from 20 to 200, and preferably from 20 to 50. A preferred polymer of this class is available from Union Carbide under the name "UCAR SILICONE ALE 56." These materials can be directly dispersed in water.

Commercially available amino substituted silicone conditioning agents which are useful herein include tradenames BY16-893 and BY16-907 available from Dow Corning, tradename XS69-B5476 available from General Electric, Abilquat series available from Goldschmidt, and Ultrasil series from Noveon (B. F. Goodrich).

Amino silicone polyether compounds are particularly useful herein as hydrophilically substituted silicone conditioning agents. Amino silicone polyether compounds useful herein are those which comprise a methylpolysiloxane moiety, an amino moiety, and an polyalkoxy moiety; is water dispersible, and preferably water soluble to some extent. Without being bound by theory, it is believed that the polyalkoxy groups such as ethylene oxide groups provide good water dispersion characteristic, while the amino groups provide good conditioning characteristic as being substantive to the hair surface. The amino silicone polyether compounds for use herein will preferably have a viscosity of less than about 5000mPa·s at 25 °C, more preferably less than about 1000mPa·s. The viscosity can be measured by means of a glass capillary viscometer as set forth in Dow Corning Corporate Test Method CTM0004, July 20, 1970. Other nonvolatile silicone conditioning agents having hair conditioning properties can also be used. Without being bound by theory, silicone conditioning agents

having lower viscosities are believed to provide faster dispersion when in contact with water.

Particularly useful amino silicone polyether compounds herein include those represented by the following structure (I):



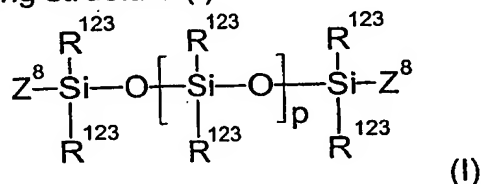
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(I)

wherein none of p, q, x, y, and z are 0, but are integers that give the compound the deposition, and dispersibility as described above, preferably the preferred viscosity properties as described above, and R is an alkyl of 1 to 3 carbon atoms.

10 Commercially available amino silicone polyether compounds that are highly preferred for use herein include those materials with tradenames: BY16-893 and BY16-907 available from Dow Corning, XS69-B5476 available from GE Toshiba Silicone, and the Ultrasil series available from BF Goodrich.

15 Silicone conditioning agents herein also include polyalkyl or polyaryl siloxanes with the following structure (I)



20 wherein R^{123} is alkyl or aryl, and x is an integer from about 7 to about 8,000. Z^8 represents groups which block the ends of the silicone chains. The alkyl or aryl groups substituted on the siloxane chain (R^{123}) or at the ends of the siloxane chains Z^8 can have any structure as long as the resulting silicone remains fluid at

room temperature, is dispersible, is neither irritating, toxic nor otherwise harmful when applied to the hair, is compatible with the other components of the composition, is chemically stable under normal use and storage conditions, and is capable of being deposited on and conditions the hair. Suitable Z^8 groups include hydroxy, methyl, methoxy, ethoxy, propoxy, and aryloxy. The two R^{123} groups on the silicon atom may represent the same group or different groups. Preferably, the two R^{123} groups represent the same group. Suitable R^{123} groups include methyl, ethyl, propyl, phenyl, methylphenyl and phenylmethyl. The preferred silicone compounds are polydimethylsiloxane, polydiethylsiloxane, and polymethylphenylsiloxane. Polydimethylsiloxane, which is also known as dimethicone, is especially preferred. The polyalkylsiloxanes that can be used include, for example, polydimethylsiloxanes. These silicone compounds are available, for example, from the General Electric Company (Waterford, New York, USA) in their Viscasil® and SF 96 series, and from Dow Corning Corp. (Midland, Michigan, USA) in their Dow Corning 200 series and BY22-067.

Polyalkylaryl siloxane fluids can also be used and include, for example, polymethylphenylsiloxanes. These siloxanes are available, for example, from the General Electric Company as SF 1075 methyl phenyl fluid or from Dow Corning as 556 Cosmetic Grade Fluid.

Highly arylated silicone compounds can be used for enhancing the shine characteristics of hair, are such as highly phenylated polyethyl silicone having refractive index of about 1.46 or higher, especially about 1.52 or higher. When these high refractive index silicone compounds are used, they should be mixed with a spreading agent, such as a surfactant or a silicone resin, as described below to decrease the surface tension and enhance the film forming ability of the material.

Other silicone conditioning agents that can be useful is a silicone gum. The term "silicone gum", as used herein, means a polyorganosiloxane material having a viscosity at 25 °C of greater than or equal to 1,000,000 centistokes. It is recognized that the silicone gums described herein can also have some overlap with the above-disclosed silicone compounds. This overlap is not intended as a limitation on any of these materials. Silicone gums are described by Petrarch, and others including U.S. Patent No. 4,152,416 to Spitzer, *et al.*, issued May 1, 1979 and Noll, Walter, Chemistry and Technology of Silicones, New York: Academic Press 1968. Also describing silicone gums are General Electric

Silicone Rubber Product Data Sheets SE 30, SE 33, SE 54 and SE 76. The "silicone gums" will typically have a weight average molecular weight in excess of about 200,000, generally between about 200,000 and about 1,000,000. Specific examples include polydimethylsiloxane, poly(dimethylsiloxane methylvinylsiloxane) copolymer, poly(dimethylsiloxane diphenylsiloxane methylvinylsiloxane) copolymer and mixtures thereof.

Also useful are silicone resins, which are highly crosslinked polymeric siloxane systems. The crosslinking is introduced through the incorporation of tri-functional and tetra-functional silanes with mono-functional or di-functional, or both, silanes during manufacture of the silicone resin. As is well understood in the art, the degree of crosslinking that is required in order to result in a silicone resin will vary according to the specific silane units incorporated into the silicone resin. In general, silicone materials which have a sufficient level of trifunctional and tetrafunctional siloxane monomer units, and hence, a sufficient level of crosslinking, such that they dry down to a rigid, or hard, film are considered to be silicone resins. The ratio of oxygen atoms to silicon atoms is indicative of the level of crosslinking in a particular silicone material. Silicone materials which have at least about 1.1 oxygen atoms per silicon atom will generally be silicone resins herein.

Preferably, the ratio of oxygen:silicon atoms is at least about 1.2:1.0. Silanes used in the manufacture of silicone resins include monomethyl-, dimethyl-, trimethyl-, monophenyl-, diphenyl-, methylphenyl-, monovinyl-, and methylvinylchlorosilanes, and tetrachlorosilane, with the methyl substituted silanes being most commonly utilized. Preferred resins are offered by General Electric as GE SS4230 and SS4267. Commercially available silicone resins will generally be supplied in a dissolved form in a low viscosity volatile or nonvolatile silicone fluid. The silicone resins for use herein should be supplied and incorporated into the present compositions in such dissolved form, as will be readily apparent to those skilled in the art. Without being bound by theory, it is believed that the silicone resins can enhance deposition of other silicone compounds on the hair and can enhance the glossiness of hair with high refractive index volumes.

Other useful silicone resins are silicone resin powders such as the material given the CTFA designation polymethylsilsequioxane, which is commercially available as Tospearl™ from Toshiba Silicones.

The method of manufacturing these silicone compounds, can be found in Encyclopedia of Polymer Science and Engineering, Volume 15, Second Edition, pp. 204-308, John Wiley & Sons, Inc., 1989.

Silicone materials and silicone resins in particular, can conveniently be identified according to a shorthand nomenclature system well known to those skilled in the art as the "MDTQ" nomenclature. Under this system, the silicone is described according to the presence of various siloxane monomer units which make up the silicone. Briefly, the symbol M denotes the mono-functional unit $(\text{CH}_3)_3\text{SiO}_{0.5}$; D denotes the difunctional unit $(\text{CH}_3)_2\text{SiO}$; T denotes the trifunctional unit $(\text{CH}_3)\text{SiO}_{1.5}$; and Q denotes the quadri- or tetra-functional unit SiO_2 . Primes of the unit symbols, e.g., M', D', T', and Q' denote substituents other than methyl, and must be specifically defined for each occurrence. Typical alternate substituents include groups such as vinyl, phenyl, amino, hydroxyl, etc. The molar ratios of the various units, either in terms of subscripts to the symbols indicating the total number of each type of unit in the silicone, or an average thereof, or as specifically indicated ratios in combination with the weight average molecular weight, complete the description of the silicone material under the MDTQ system. Higher relative molar amounts of T, Q, T' and/or Q' to D, D', M and/or M' in a silicone resin is indicative of higher levels of crosslinking. As discussed above, however, the overall level of crosslinking can also be indicated by the oxygen to silicon ratio.

The silicone resins for use herein which are preferred are MQ, MT, MTQ, MQ and MDTQ resins. Thus, the preferred silicone substituent is methyl. Especially preferred are MQ resins wherein the M:Q ratio is from about 0.5:1.0 to about 1.5:1.0 and the weight average molecular weight of the resin is from about 1000 to about 10,000.

Commercially available silicone conditioning agents which are useful herein include Dimethicone with tradename DC200, cetyl Dimethicone with tradename DC2502, stearyl Dimethicone with tradename DC2503, emulsified polydimethyl siloxanes with tradenames DC1664 and DC1784, and alkyl grafted copolymer silicone emulsion with tradename DC2-2845; all available from Dow Corning Corporation (Midland, Michigan, USA), emulsion polymerized Dimethiconol available from Toshiba Silicone Co., Ltd. (Tokyo, Japan) as described in GB application 2,303,857, mixture of Dimethicone and Dimethiconol

with tradename DCQ2-1403, and mixture of Cyclomethicone and Dimethiconol with tradename DRQ2-1401, both mixtures available from Dow Corning.

AQUEOUS CARRIER

The compositions of the present invention comprise an aqueous carrier.
5 Aqueous carriers useful herein include water and/or water-soluble solvents.

Water is useful herein. Deionized water is preferably used. Water from natural sources including mineral cations can also be used, depending on the desired characteristic of the product.

Water-soluble solvents such as lower alkyl alcohols and polyhydric
10 alcohols are useful herein. The lower alkyl alcohols useful herein are monohydric alcohols having 1 to 6 carbons, more preferably ethanol and isopropanol. The polyhydric alcohols useful herein include propylene glycol, hexylene glycol, glycerin, propane diol, ethylene glycol, diethylene glycol, sorbitol, and other sugars which are in liquid form at ambient temperature.

ADDITIONAL CONDITIONING AGENT

The composition of the present composition may further comprise additional conditioning agents. The additional conditioning agents useful in the present invention are those which are dispersible in water. Particularly preferred
20 are those which provide a transparent concentrated hair conditioning composition, and provide a transparent treated water. Suitable additional conditioning agents are selected from the group consisting of cationic surfactants, cationic polymers, polyalkylene glycols and mixtures thereof, preferably mono long-chain ammonium compounds, hydrophilically substituted cationic surfactants, cationic polymers, polyethylene glycols, and mixtures thereof. The
25 type of additional conditioning agents are selected depending on the desired characteristics of the product. Highly water soluble additional conditioning agents are typically used, however, at a level such that the total of the silicone conditioning agent and the additional conditioning agent does not exceed about 70% of the conditioning composition. Additional conditioning agents are
30 preferably used to provide benefits provided by the different conditioning agents. Additional conditioning agents which are less water soluble can be used in combination with highly water soluble additional conditioning agents.

The present composition preferably comprises from about 0.01% to about 50%, preferably from about 1% to about 20% of additional conditioning agents. The level is selected according to the form in which the product is provided and to

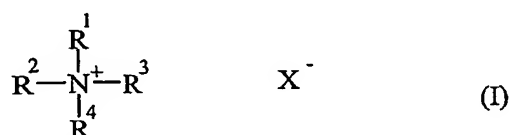
the desired concentration of the treated water to be made and applied to the hair.

In one preferred embodiment, from about 1% to about 20% of additional conditioning agent selected from the group consisting of mono long-chain ammonium compounds, hydrophilically substituted cationic surfactants, cationic polymers, polyethylene glycols, and mixtures thereof, is contained.

Cationic Surfactant

Cationic surfactants are useful as additional conditioning agents herein.

Among the cationic surfactants useful herein are those generally described as mono long-chain ammonium compounds, corresponding to the general formula (I):

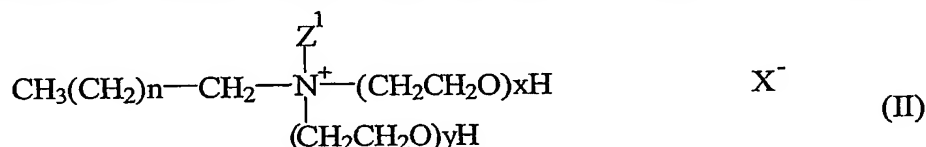


wherein R¹ is selected from an aliphatic group of from 8 to 30 carbon atoms or an aromatic, alkoxy, polyoxyalkylene, alkylamido, hydroxyalkyl, aryl or alkylaryl group having up to about 22 carbon atoms, R², R³, and R⁴ are independently selected from an aliphatic group of from 1 to about 3 carbon atoms or an aromatic, alkoxy, polyoxyalkylene, alkylamido, hydroxyalkyl, aryl or alkylaryl group having up to about 8 carbon atoms; and X is a salt-forming anion such as those selected from halogen, (e.g. chloride, bromide), acetate, citrate, lactate, glycolate, phosphate, nitrate, sulfonate, sulfate, alkylsulfate, and alkyl sulfonate radicals. The aliphatic groups can contain, in addition to carbon and hydrogen atoms, ether linkages, and other groups such as amino groups. The longer chain aliphatic groups, e.g., those of about 12 carbons, or higher, can be saturated or unsaturated. Preferred is when R¹ is selected from C₈ to about C₂₂ alkyl.

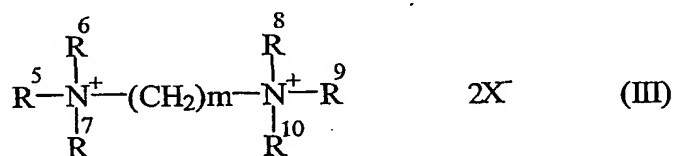
Among the cationic surfactants of general formula (I), preferred are those containing in the molecule at least one alkyl chain having at least 16 carbons. Nonlimiting examples of such preferred cationic surfactants include: cetyl trimethyl ammonium chloride available, for example, with tradename CA-2350 from Nikko Chemicals and CTAC 30KC available from KCI, stearyl trimethyl ammonium chloride with tradename Arquad 18/50 available from Akzo Nobel, hydrogenated tallow alkyl trimethyl ammonium chloride, stearyl dimethyl benzyl ammonium chloride, stearyl propyleneglycol phosphate dimethyl ammonium chloride, stearyl amidopropyl dimethyl benzyl ammonium chloride, stearyl

amidopropyl dimethyl (myristylacetate) ammonium chloride, and N-(stearoyl colamino formyl methy) pyridinium chloride.

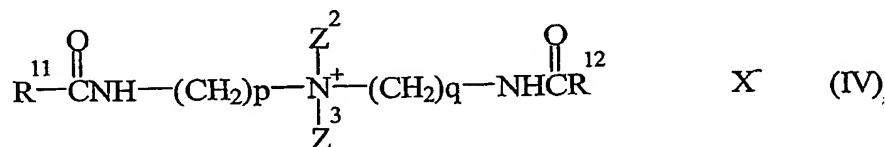
Also preferred are hydrophilically substituted cationic surfactants in which at least one of the substituents contain one or more aromatic, ether, ester, amido, or amino moieties present as substituents or as linkages in the radical chain, wherein at least one of the R¹ - R⁴ radicals contain one or more hydrophilic moieties selected from alkoxy (preferably C₁ - C₃ alkoxy), polyoxyalkylene (preferably C₁ - C₃ polyoxyalkylene), alkylamido, hydroxyalkyl, alkylester, and combinations thereof. Preferably, the hydrophilically substituted cationic conditioning surfactant contains from 2 to about 10 nonionic hydrophile moieties located within the above stated ranges. Preferred hydrophilically substituted cationic surfactants include those of the formula (II) through (VIII) below:

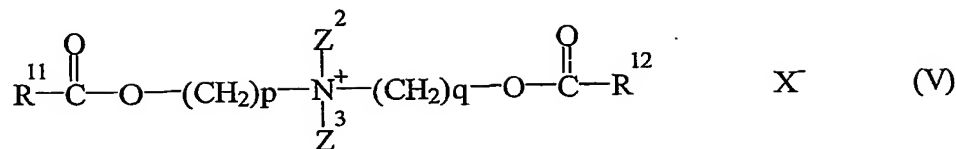


wherein n is from 8 to about 28, x+y is from 2 to about 40, Z¹ is a short chain alkyl, preferably a C₁ - C₃ alkyl, more preferably methyl, or (CH₂CH₂O)_zH wherein x+y+z is up to 60, and X is a salt forming anion as defined above;

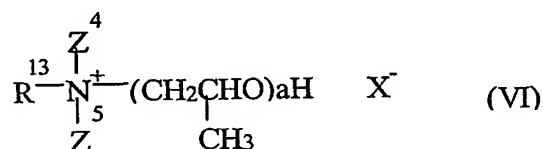


wherein m is 1 to 5, one or more of R⁵, R⁶, and R⁷ are independently an C₁ - C₃₀ alkyl, the remainder are CH₂CH₂OH, one or two of R⁸, R⁹, and R¹⁰ are independently an C₁ - C₃₀ alkyl, and remainder are CH₂CH₂OH, and X is a salt forming anion as mentioned above;

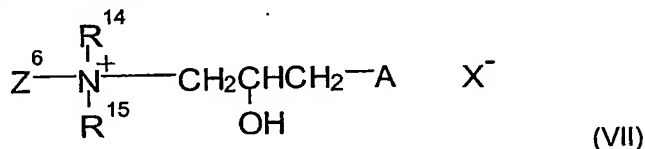




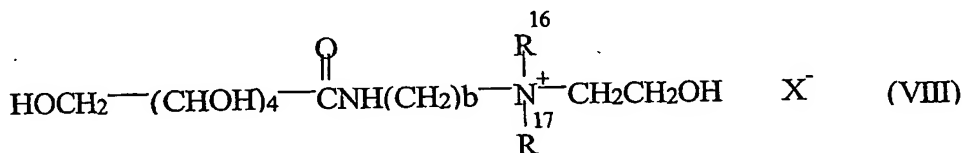
wherein, independently for formulae (IV) and (V), Z² is an alkyl, preferably a C₁ - C₃ alkyl, more preferably methyl, and Z³ is a short chain hydroxyalkyl, preferably hydroxymethyl or hydroxyethyl, p and q independently are integers from 2 to 4, inclusive, preferably from 2 to 3, inclusive, more preferably 2, R¹¹ and R¹², independently, are substituted or unsubstituted hydrocarbyls, preferably C₁₂ - C₂₀ alkyl or alkenyl, and X is a salt forming anion as defined above;



wherein R¹³ is a hydrocarbyl, preferably a C₁ - C₃ alkyl, more preferably methyl, Z⁴ and Z⁵ are, independently, short chain hydrocarbyls, preferably C₂ - C₄ alkyl or alkenyl, more preferably ethyl, a is from 2 to about 40, preferably from about 7 to about 30, and X is a salt forming anion as defined above;



wherein R¹⁴ and R¹⁵, independently, are C₁ - C₃ alkyl, preferably methyl, Z⁶ is a C₁₂ - C₂₂ hydrocarbyl, alkyl carboxy or alkylamido, and A is a protein, preferably a collagen, keratin, milk protein, silk, soy protein, wheat protein, or hydrolyzed forms thereof; and X is a salt forming anion as defined above;



wherein b is 2 or 3, R¹⁶ and R¹⁷, independently are C₁ - C₃ hydrocarbyls preferably methyl, and X is a salt forming anion as defined above. Nonlimiting examples of hydrophilically substituted cationic surfactants useful in the present

invention include the materials having the following CTFA designations: quaternium-16, quaternium-26, quaternium-27, quaternium-30, quaternium-33, quaternium-43, quaternium-52, quaternium-53, quaternium-56, quaternium-60, quaternium-61, quaternium-62, quaternium-70, quaternium-71, quaternium-72, 5 quaternium-75, quaternium-76 hydrolyzed collagen, quaternium-77, quaternium-78, quaternium-79 hydrolyzed collagen, quaternium-79 hydrolyzed keratin, quaternium-79 hydrolyzed milk protein, quaternium-79 hydrolyzed silk, quaternium-79 hydrolyzed soy protein, and quaternium-79 hydrolyzed wheat protein, quaternium-80, quaternium-81, quaternium-82, quaternium-83, 10 quaternium-84, and mixtures thereof.

Highly preferred hydrophilically substituted cationic surfactants include dialkylamido ethyl hydroxyethylmonium salt, dialkylamidoethyl dimonium salt, dialkyloyl ethyl hydroxyethylmonium salt, dialkyloyl ethyldimonium salt, alkyl amidopropyl trimonium salt, polyoxyethylene alkyl ammonium salt, and mixtures 15 thereof; for example, commercially available under the following tradenames; VARISOFT 110, VARISOFT PATC, VARIQUAT K1215 and 638 from Witco Chemical, ETHOQUAD 18/25, ETHOQUAD O/12PG, ETHOQUAD C/25, and ETHOQUAD S/25 from Akzo, DEHYQUART SP from Henkel, and MONAQUAT ISEIS, and MONAQUAT SL-5 available from Uniqema.

20 **Cationic Polymer**

Cationic polymers are useful as additional conditioning agents herein. As used herein, the term "polymer" shall include materials whether made by polymerization of one type of monomer or made by two (i.e., copolymers) or more 25 types of monomers.

The cationic polymers hereof will generally have a weight average molecular weight which is at least about 5,000, typically at least about 10,000, and is less than about 10 million. Preferably, the molecular weight is from about 100,000 to about 2 million. The cationic polymers will generally have cationic nitrogen-containing moieties such as quaternary ammonium or cationic amino 30 moieties, and mixtures thereof.

Any anionic counterions can be utilized for the cationic polymers so long as the water solubility criteria is met. Suitable counterions include halides (e.g., Cl, Br, I, or F, preferably Cl, Br, or I), sulfate, and methylsulfate. Others can also be used, as this list is not exclusive.

The cationic nitrogen-containing moiety will be present generally as a substituent, on a fraction of the total monomer units of the cationic polymers. Thus, the cationic polymer can comprise copolymers, terpolymers, etc. of quaternary ammonium or cationic amine-substituted monomer units and other
5 non-cationic units referred to herein as spacer monomer units. Such polymers are known in the art, and a variety can be found in the CTFA Cosmetic Ingredient Dictionary, 3rd edition, edited by Estrin, Crosley, and Haynes, (The Cosmetic, Toiletry, and Fragrance Association, Inc., Washington, D.C., 1982).

Suitable cationic polymers include, for example, copolymers of vinyl
10 monomers having cationic amine or quaternary ammonium functionalities with water soluble spacer monomers such as acrylamide, methacrylamide, alkyl and dialkyl acrylamides, alkyl and dialkyl methacrylamides, alkyl acrylate, alkyl methacrylate, vinyl caprolactone, and vinyl pyrrolidone. The alkyl and dialkyl substituted monomers preferably have C₁ - C₇ alkyl groups, more preferably C₁ -
15 C₃ alkyl groups. Other suitable spacer monomers include vinyl esters, vinyl alcohol (made by hydrolysis of polyvinyl acetate), maleic anhydride, propylene glycol, and ethylene glycol.

The cationic amines can be primary, secondary, or tertiary amines, depending upon the particular species and the pH of the composition. In general,
20 secondary and tertiary amines, especially tertiary amines, are preferred.

Amine-substituted vinyl monomers can be polymerized in the amine form, and then optionally can be converted to ammonium by a quaternization reaction. Amines can also be similarly quaternized subsequent to formation of the polymer. For example, tertiary amine functionalities can be quaternized by reaction with a
25 salt of the formula R'X wherein R' is a short chain alkyl, preferably a C₁ - C₇ alkyl, more preferably a C₁ - C₃ alkyl, and X is an anion which forms a water soluble salt with the quaternized ammonium.

Suitable cationic amino and quaternary ammonium monomers include, for example, vinyl compounds substituted with dialkylaminoalkyl acrylate,
30 dialkylaminoalkyl methacrylate, monoalkylaminoalkyl acrylate, monoalkylaminoalkyl methacrylate, trialkyl methacryloxyalkyl ammonium salt, trialkyl acryloxyalkyl ammonium salt, diallyl quaternary ammonium salts, and vinyl quaternary ammonium monomers having cyclic cationic nitrogen-containing rings such as pyridinium, imidazolium, and quaternized pyrrolidone, e.g., alkyl vinyl
35 imidazolium, alkyl vinyl pyridinium, alkyl vinyl pyrrolidone salts. The alkyl portions

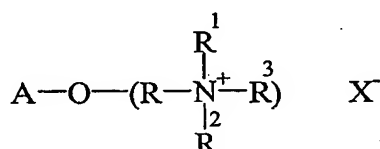
of these monomers are preferably lower alkyls such as the C₁ - C₃ alkyls, more preferably C₁ and C₂ alkyls. Suitable amine-substituted vinyl monomers for use herein include dialkylaminoalkyl acrylate, dialkylaminoalkyl methacrylate, dialkylaminoalkyl acrylamide, and dialkylaminoalkyl methacrylamide, wherein the alkyl groups are preferably C₁ - C₇ hydrocarbyls, more preferably C₁ - C₃, alkyls.

The cationic polymers hereof can comprise mixtures of monomer units derived from amine- and/or quaternary ammonium-substituted monomer and/or compatible spacer monomers.

Suitable cationic hair conditioning polymers include, for example: copolymers of 1-vinyl-2-pyrrolidone and 1-vinyl-3-methylimidazolium salt (e.g., chloride salt) (referred to in the industry by the Cosmetic, Toiletry, and Fragrance Association, "CTFA", as Polyquaternium-16), such as those commercially available from BASF Wyandotte Corp. (Parsippany, NJ, USA) under the LUVIQUAT tradename (e.g., LUVIQUAT FC 370); copolymers of 1-vinyl-2-pyrrolidone and dimethylaminoethyl methacrylate (referred to in the industry by CTFA as Polyquaternium-11) such as those commercially available from Gaf Corporation (Wayne, NJ, USA) under the GAFQUAT tradename (e.g., GAFQUAT 755N); cationic diallyl quaternary ammonium-containing polymers, including, for example, dimethyldiallylammonium chloride homopolymer and copolymers of acrylamide and dimethyldiallylammonium chloride, referred to in the industry (CTFA) as Polyquaternium 6 and Polyquaternium 7 such as those with tradenames Salcare SC10 and Salcare SC11 available from Ciba Specialty Chemicals, and those commercially available from Calgon with tradename Merquat 2200, respectively; and mineral acid salts of amino-alkyl esters of homo- and co-polymers of unsaturated carboxylic acids having from 3 to 5 carbon atoms, as described in U.S. Patent 4,009,256, incorporated herein by reference.

Other cationic polymers that can be used include polysaccharide polymers, such as cationic cellulose derivatives and cationic starch derivatives.

Cationic polysaccharide polymer materials suitable for use herein include those of the formula:



wherein: A is an anhydroglucose residual group, such as a starch or cellulose anhydroglucose residual, R is an alkylene oxyalkylene, polyoxyalkylene, or hydroxyalkylene group, or combination thereof, R¹, R², and R³ independently are alkyl, aryl, alkylaryl, arylalkyl, alkoxyalkyl, or alkoxyaryl groups, each group
 5 containing up to about 18 carbon atoms, and the total number of carbon atoms for each cationic moiety (i.e., the sum of carbon atoms in R¹, R² and R³) preferably being about 20 or less, and X is an anionic counterion, as previously described.

Highly preferred cationic cellulose polymers are available from Amerchol
 10 Corp. (Edison, NJ, USA) in their Polymer JR® and LR® series of polymers, as salts of hydroxyethyl cellulose reacted with trimethyl ammonium substituted epoxide, referred to in the industry (CTFA) as Polyquaternium 10. Another type of cationic cellulose includes the polymeric quaternary ammonium salts of hydroxyethyl cellulose reacted with lauryl dimethyl ammonium-substituted
 15 epoxide, referred to in the industry (CTFA) as Polyquaternium 24. These materials are available from Amerchol Corp. (Edison, NJ, USA) under the tradename Quaterisoft Polymer LM-200®.

Other cationic polymers that can be used include cationic guar gum derivatives, such as guar hydroxypropyltrimonium chloride (commercially
 20 available from Celanese Corp. in their Jaguar R series). Other materials include quaternary nitrogen-containing cellulose ethers (e.g., as described in U.S. Patent 3,962,418, incorporated herein by reference), and copolymers of etherified cellulose and starch (e.g., as described in U.S. Patent 3,958,581, incorporated herein by reference.)

25 Other cationic polymers useful herein are:

(1) Cationic polymers chosen from the group comprising:

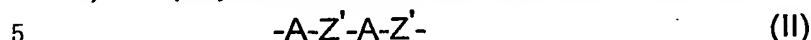
i) polymers containing units of the formula:



wherein A denotes a radical containing two amino groups, preferably a
 30 piperazinyl radical, and Z¹ and Z² independently denote a divalent radical which is a straight-chain or branched-chain alkylene radical which contains up to about 7 carbon atoms in the main chain, is unsubstituted or substituted by one or more hydroxyl groups and can also contain one or more oxygen, nitrogen and sulphur atoms and 1 to 3 aromatic and/or heterocyclic rings, the oxygen, nitrogen and
 35 sulphur atoms generally being present in the form of an ether or thioether,

sulphoxide, sulphone, sulphonium, amine, alkylamine, alkenylamine, benzylamine, amine oxide, quaternary ammonium, amide, imide, alcohol, ester and/or urethane group;

ii) polymers containing units of the formula:



wherein A denotes a radical containing two amino groups, preferably a piperaziny radical, and Z' denotes the symbol Z³ and Z⁴ while denoting the symbol Z⁴ at least once; Z³ denotes a divalent radical which is a straight-chain or branched-chain alkylene or hydroxyalkylene radical having up to about 7 carbon
10 atoms in the main chain, and Z⁴ is a divalent radical which is a straight-chain or branched-chain alkylene radical which has up to about 7 carbon atoms in the main chain, is unsubstituted and substituted by one or more hydroxyl radicals and is interrupted by one or more nitrogen atoms, the nitrogen atom being substituted
15 by an alkyl chain having from 1 to 4 carbon atoms, preferably 4 carbon atoms, which is optionally interrupted by an oxygen atom and optionally contains one or more hydroxyl groups; and

iii) the alkylation products, with alkyl and benzyl halides of 1 to 6 carbon atoms, alkyl tosylates or mesylates, and the oxidation products, of the polymers of the formulae (I) and (II) indicated above under i) and ii).

20 (2) Polyamino-polyamides prepared by the polycondensation of an acid compound with a polyamine. The acid compound can be organic dicarboxylic acids, aliphatic monocarboxylic and dicarboxylic acids containing a double bond, esters of the abovementioned acids, preferably the esters with lower alkanols having from 1 to 6 carbon atoms, and mixtures thereof. The polyamine is a bis-
25 primary or mono- or bis-secondary polyalkylene-polyamine wherein up to 40 mol% of this polyamine can be a bis-primary amine, preferably ethylenediamine, or a bis-secondary amine, preferably piperazine, and up to 20 mol% can be hexamethylenediamine.

(3) The above mentioned polyamino-polyamides can be alkylated and/or
30 crosslinked. The alkylation can be carried out with glycidol, ethylene oxide, propylene oxide or acrylamide. The crosslinking is carried out by means of a crosslinking agent such as:

i) epihalogenohydrins, diepoxides, dianhydrides, unsaturated anhydrides and bis-saturated derivatives, in proportions of 0.025 to 0.35 mol of crosslinking agent
35 per amine group of the polyamino-polyamide;

ii) bis-halogenohydrins, bis-azetidinium compounds, bishalogenoacyldiamines and bis-(alkyl halides);

iii) oligomers obtained by reacting a compound chosen from the group comprising bis-halogenohydrins, bis-azetidinium compounds, bis-halogenoacyldiamines, bis-(alkyl halides), epihalogenohydrins, diepoxides and bis-unsaturated derivatives, with another compound which is a difunctional compound which is reactive towards the compound; and

iv) the quaternisation product of a compound chosen from the compounds ii) and the oligomers iii) and containing one or more tertiary amine groups which can be totally or partially alkylated with an alkylating agent preferably chosen from methyl or ethyl chlorides, bromides, iodides, sulphates, mesylates and tosylates, benzyl chloride or bromide, ethylene oxide, propylene oxide and glycidol, the crosslinking being carried out by means of 0.025 to 0.35 mol, in particular of 0.025 to 0.2 mol and more particularly of 0.025 to 0.1 mol, of crosslinking agent per amine group of the polyamino-polyamide.

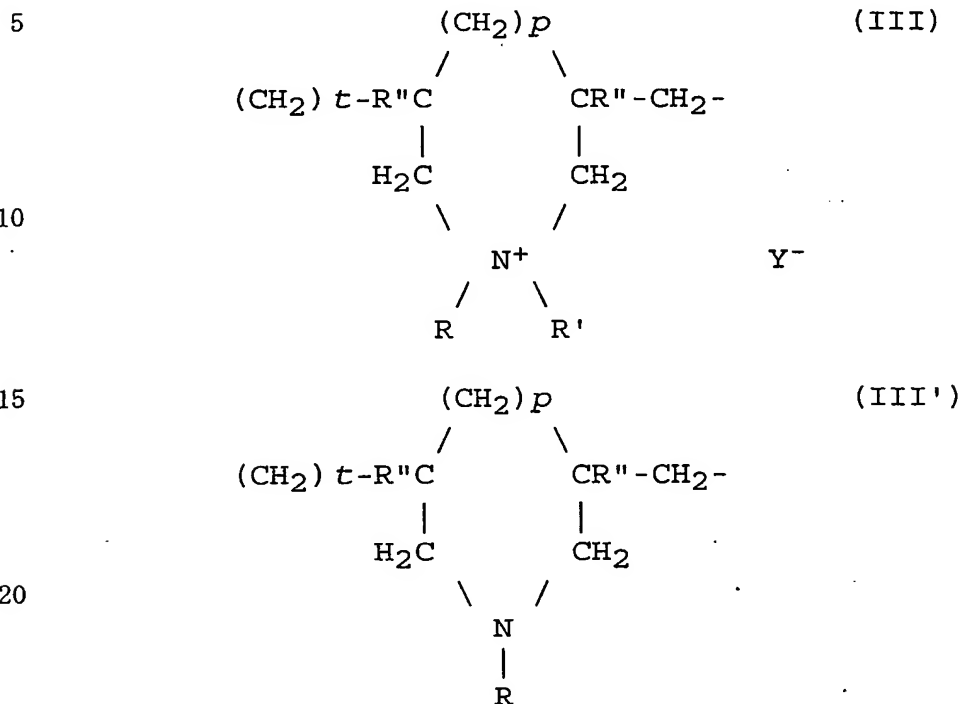
(4) Polyamino-polyamide derivatives resulting from the condensation of a polyalkylene-polyamine with a polycarboxylic acid, followed by alkylation by means of difunctional agents, such as the adipic acid/dialkylaminohydroxyalkyl-dialkylenetriamine copolymers in which the alkyl radical contains 1 to 4 carbon atoms and preferably denotes methyl, ethyl or propyl.

Useful polymers are adipic acid/dimethylaminohydroxypropyl-diethylenetriamine copolymers sold under the name Cartaretine F, F⁴ or F⁸ by SANDOZ.

(5) Polymers obtained by reacting polyalkylenepolyamine containing two primary amine groups and at least one secondary amine group, with a dicarboxylic acid chosen from diglycolic acid and saturated aliphatic dicarboxylic acids having 3 to 8 carbon atoms, the molar ratio of the polyalkylene-polyamine to the dicarboxylic acid being from 0.8:1 to 1.4:1, and the resulting polyamide being reacted with epichlorohydrin in a molar ratio of epichlorohydrin to the secondary amine groups of the polyamide of from 0.5:1 to 1.8:1.

Useful polymers are those sold under the name HERCOSETT 57 by Hercules Incorporated, and that sold under the name PD 170 or DELSETTE 101 by Hercules.

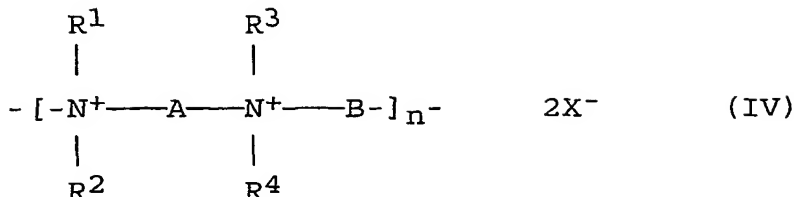
(6) Cyclic polymers generally having a molecular weight of 20,000 to 3,000,000 such as homopolymers containing, as the main constituent of the chain, units corresponding to the formula (III) or (III')



in which p and t are 0 or 1, and $p+t=1$, R'' denotes hydrogen or methyl, R and R' independently of one another denote an alkyl group having from 1 to 22 carbon-atoms, a hydroxylalkyl group in which the alkyl group preferably has 1 to 5 carbon atoms, or a lower amidoalkyl group, and R and R' can denote, together with the nitrogen atom to which they are attached, heterocyclic groups such as piperidinyl or morpholinyl, and Y is bromide, chloride, acetate, borate, citrate, tartrate, bisulphate, bisulphite, sulphate or phosphate. Copolymers containing units of the formula III and III' may also contain units derived from acrylamide or from diacetoneacrylamide.

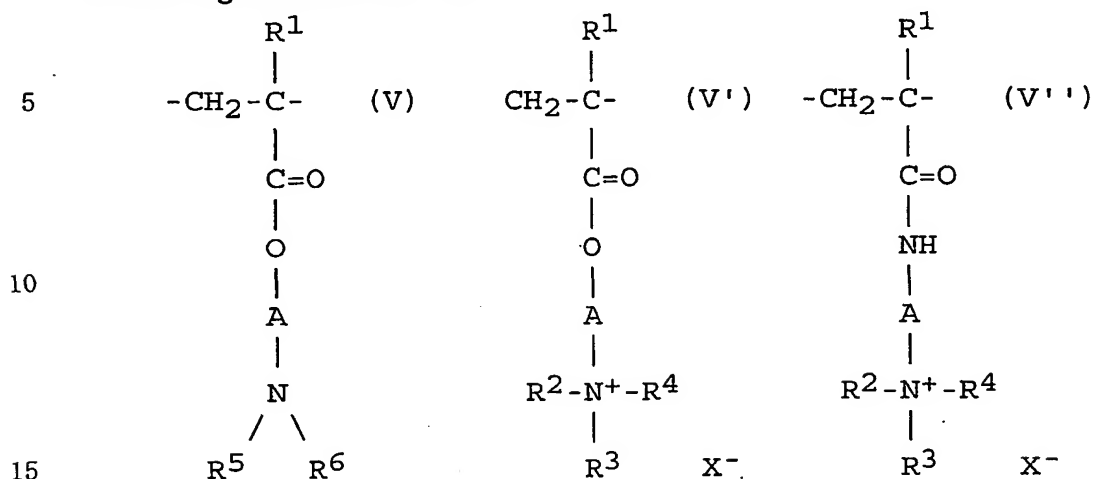
Amongst the quaternary ammonium polymers of the type defined above, those which are preferred are the dimethyldiallylammonium chloride homopolymer sold under the name MERQUAT 100 and having a molecular weight of less than 100,000, and the dimethyldiallylammonium chloride/acrylamide copolymer having a molecular weight of more than 500,000 and sold under the name MERQUAT 550 by CALGON Corporation.

(7) Poly-(quaternary ammonium) compounds of the formula



- wherein R¹, R², R³, and R⁴ are independently aliphatic, alicyclic or arylaliphatic radicals containing a maximum of 20 carbon atoms, or lower hydroxyaliphatic radicals, or alternatively, with the nitrogen atoms to which they are attached, heterocyclic rings optionally containing a second hetero-atom other than nitrogen, or alternatively R¹, R², R³, and R⁴ represent a group CH₂CHR'³R'⁴ wherein R'³ denoting hydrogen or lower alkyl and R'⁴ denoting SO, CN, CON(R'⁶)₂, COOR'⁵, COR'⁵, COOR'⁷D, or CONHR'⁷D; R'⁵ denoting lower alkyl, R'⁶ denoting hydrogen or lower alkyl, R'⁷ denoting alkylene and D denoting a quaternary ammonium group; A and B independently represent a polymethylene group containing from 2 to 20 carbon atoms, which can be linear or branched, saturated or unsaturated and can contain, inserted in the main chain one or more groups -CH₂-Y-CH₂- wherein Y denotes benzene, oxygen, sulfur, SO, SO₂, SS, NR'⁸, N⁺(R'⁹)₂X¹⁻, CHOH, NHCONH, CONR'⁸, or COO; X¹⁻ denoting an anion derived from a mineral or organic acid, R'⁸ denoting hydrogen or lower alkyl and R'⁹ denoting lower alkyl, or alternatively A and R¹ and R³ form a piperazine ring with the two nitrogen atoms to which they are attached. If A denotes a linear or branched, saturated or unsaturated alkylene or hydroxyalkylene radical, B can also denote a group: -(CH₂)_n-CO-D-OC-(CH₂)_n-; wherein n is selected so that the molecular weight is generally between 1,000 and 100,000; and D denotes:
- i) a glycol radical of the formula -O-Z-O-, in which Z denotes a linear or branched hydrocarbon radical or a group corresponding to the formulae: -[CH₂-CH₂-O-]_x-CH₂-CH₂- or -[CH₂-C(CH₃)H-O-]_y-CH₂-C(CH₃)H- wherein x and y denote an integer from 1 to 4, representing a definite and unique degree of polymerisation;
 - ii) a bis-secondary diamine radical, such as a piperazine derivative;
 - iii) a bis-primary diamine radical of the formula: -N-H-Y-NH-, in which Y denotes a linear or branched hydrocarbon radical or the divalent radical -CH₂-CH₂-S-S-CH₂-CH₂-; or
 - iv) a ureylene group of the formula -N-H-CO-NH-.

(8) Homopolymers or copolymers derived from acrylic or methacrylic acid and containing at least one unit:



wherein R^1 is H or CH_3 , A is a linear or branched alkyl group having 1 to 6 carbon atoms or a hydroxyalkyl group having 1 to 4 carbon atoms, R^2 , R^3 and R^4 independently denote an alkyl group having 1 to 18 carbon atoms or a benzyl group, R^5 and R^6 denote H or alkyl having 1 to 6 carbon atoms and X denotes methosulphate or halide, such as chloride or bromide.

The comonomer or comonomers which can be used typically belong to the family comprising: acrylamide, methacrylamide, diacetone-acrylamide, acrylamide and methacrylamide substituted on the nitrogen by one or more lower alkyls, alkyl esters of acrylic and methacrylic acids, vinylpyrrolidone and vinyl esters.

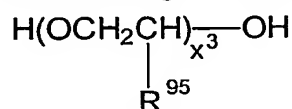
(9) Other cationic polymers which can be used are polyalkyleneimines, in particular, polyethyleneimines, polymers containing vinylpyridine units or vinylpyridinium units in the chain, condensates of polyamines and of epichlorohydrin, poly-(quaternary ureylenes) and chitin derivatives.

Highly preferred cationic polymers include commercially available material such as Polyquaternium 4 under the tradenames CELQUAT H100 and CELQUAT L200 supplied by National Starch & Chemicals, Polyquaternium 7 with tradenames Salcare SC10 and Salcare SC11 available from Ciba Specialty Chemicals, and Polyquaternium 11 under the tradename GAFQUAT 755N supplied by ISP.

Polyalkylene Glycols

The polyalkylene glycols useful herein include those which are soluble or dispersible in water. Polyethylene glycols are preferred.

Polyalkylene glycols having a molecular weight of more than about 100 are useful herein. Useful are those having the following general formula:



wherein R⁹⁵ is selected from the group consisting of H, methyl, and mixtures thereof. When R⁹⁵ is H, these materials are polymers of ethylene oxide, which are also known as polyethylene oxides, polyoxyethylenes, and polyethylene glycols. When R⁹⁵ is methyl, these materials are polymers of propylene oxide, which are also known as polypropylene oxides, polyoxypropylenes, and polypropylene glycols. When R⁹⁵ is methyl, it is also understood that various positional isomers of the resulting polymers can exist. Ethylene oxide polymers are preferred in view of their generally good water solubility, dispersibility, and transparency. Polyethylene-polypropylene glycols and polyoxyethylene-polyoxypropylene copolymer polymers having good dispersibility and transparency may also be useful. In the above structure, x³ has an average value of from about 4 to about 600, preferably from about 6 to about 120, and more preferably from about 10 to about 40. Polyethylene glycol polymers useful herein are Carbowax PEG 600 wherein R⁹⁵ equals H and x³ has an average value of about 12, available from Amerchol Inc., and Polyethylene Glycol #1000 wherein R⁹⁵ equals H and x³ has an average value of about 20 available from Kanto Chemical Co., Ltd.

RINSE AID SYSTEM

The composition of the present invention may further contain a rinse aid system for effective rinsing of the shampoo composition and soils from the hair by reducing suds, and/or reducing water hardness. The rinse aid system may be provided within the conditioning composition, or as an independent composition. When the rinse aid system is provided as an independent composition, it is preferably released in the water simultaneously with the conditioning composition.

The rinse aid system is selected from the group consisting of a pH control agent for suppressing the pH to below 6.5, a suds suppressing agent, a metal ion control agent, a crystal growth inhibitor, a dispersant polymer, a builder, and mixtures thereof. Preferably a mixture is used. Preferably a suds suppressing agent is comprised in the rinse aid system.

pH Control Agents

Inorganic and organic acids useful as pH control agents include, for example, carboxylate acids, such as citric and succinic acids, polycarboxylate acids, such as polyacrylic acid, and also acetic acid, boric acid, malonic acid, adipic acid, fumaric acid, lactic acid, glycolic acid, tartaric acid, tartronic acid, maleic acid, their derivatives and any mixtures of the foregoing.

A pH buffering agent may be used to maintain the desired pH range upon dissolving/dispersing of the composition. Materials useful as pH buffering agents include alkali metal salts of carbonates, preferably sodium bicarbonate, polycarbonates, sesquicarbonates, silicates, polysilicates, borates, metaborates, phosphates, preferably sodium phosphate such as sodium hydrogenophosphate, polyphosphate like sodium tripolyphosphate, alluminates, and mixtures thereof, and preferably are selected from alkali metal salts of carbonates, phosphates, and mixtures thereof.

Suds Suppressing Agent

Suds suppressing agents useful herein include antifoam compounds. Antifoam compounds for use herein are silica components. Preferably, these silica components are used in combination with the silicone compound described above as a additional conditioning agent. The term "silicone" as used herein, and in general throughout the industry, encompasses a variety of relatively high molecular weight polymers containing siloxane units and hydrocarbyl group of various types like the polyorganosiloxane oils, such as polydimethyl-siloxane, dispersions or emulsions of polyorganosiloxane oils or resins, and combinations of polyorganosiloxane with silica particles wherein the polyorganosiloxane is chemisorbed or fused onto the silica. Silica components useful for suds suppressers are well known in the art and are, for example, disclosed in U.S. Patent 4,265,779, issued May 5, 1981 to Gandolfo et al and European Patent Application No. 89307851.9, published February 7, 1990, by Starch, M. S. Other silicone suds suppressers are disclosed in U.S. Patent 3,455,839 which relates to compositions and processes for defoaming aqueous solutions by incorporating therein small amounts of polydimethylsiloxane fluids. Mixtures of silicone and silanated silica are described, for instance, in German Patent Application DOS 2,124,526. Examples of suitable silicone antifoam compounds are the combinations of polyorganosiloxane with silica particles commercially available from Dow Corning, SE39 available from Wacker Chemie, and TSA775 available from General Electric.

Other antifoam compounds include the monocarboxylic fatty acids and soluble salts thereof, such as those having hydrocarbyl chains of 10 to about 24 carbon atoms, preferably 12 to 18 carbon atoms like the tallow amphopolycarboxyglycinate commercially available under the trade name
5 TAPAC. Suitable salts include the alkali metal salts such as sodium, potassium, and lithium salts, and ammonium and alkanolammonium salts.

Other suitable antifoam compounds include, for example, high molecular weight hydrocarbons such as paraffin, light petroleum, odorless hydrocarbons, fatty esters (e.g. fatty acid triglycerides, glyceryl derivatives, polysorbates), fatty
10 acid esters of monovalent alcohols, aliphatic C₁₈-C₄₀ ketones (e.g. stearone) N-alkylated amino triazines such as tri- to hexa-alkylmelamines or di- to tetraalkyldiamine chlortriazines formed as products of cyanuric chloride with two or three moles of a primary or secondary amine containing 1 to 24 carbon atoms, propylene oxide, bis stearic acid amide and monostearyl phosphates such as
15 monostearyl alcohol phosphate ester and monostearyl di-alkali metal (e.g., K, Na, and Li) phosphates and phosphate esters, quaternary ammonium compounds, di-alkyl quaternary compounds, poly functionalised quaternary compounds, and nonionic polyhydroxyl derivatives.

Copolymers of ethylene oxide and propylene oxide, particularly the mixed
20 ethoxylated/propoxylated fatty alcohols with an alkyl chain length of from 10 to 16 carbon atoms, a degree of ethoxylation of from 3 to 30 and a degree of propoxylation of from 1 to 10, are also suitable antifoam compounds for use herein.

Other suds suppressers useful herein comprise secondary C₆-C₁₆ alkyl
25 alcohols having a C₁-C₁₆ chain like the 2-Hexyldecanol commercially available under the trade name ISOFOL16, 2-Octyldodecanol commercially available under the tradename ISOFOL20, and 2-butyl octanol, which is available under the trademark ISOFOL 12 from Condea. A preferred alcohol is 2-butyl octanol, which is available from Condea under the trademark ISOFOL 12. Mixtures of
30 secondary alcohols are available under the trademark ISALCHEM 123 from Enichem.

Metal Ion Control Agents

Heavy metal ion (HMI) sequestrants which act to sequester (chelate) heavy metal ions are useful herein. These components may have calcium and
35 magnesium chelation capacity, but preferentially they bind heavy metal ions such

as iron, manganese and copper. These compounds are even more desired when the water is a tap water of low quality and consequently that which comprises a high level of HMI.

Heavy metal ion sequestrants, which are acidic in nature, having for
5 example phosphonic acid or carboxylic acid functionalities, may be present either in their acid form or as a complex/salt with a suitable counter cation such as an alkali or alkaline metal ion, ammonium, or substituted ammonium ion, or any mixtures thereof.

Suitable heavy metal ion sequestrants for use herein include the organo
10 aminophosphonates, such as the amino alkylene poly (alkylene phosphonates) and nitrilo trimethylene phosphonates. Preferred organo aminophosphonates are diethylene triamine penta (methylene phosphonate) and hexamethylene diamine tetra (methylene phosphonate).

Other suitable heavy metal ion sequestrants for use herein include
15 nitrilotriacetic acid and polyaminocarboxylic acids such as ethylenediaminetetracetic acid, ethylenetriamine pentacetic acid, or ethylenediamine disuccinic acid. A further suitable material is ethylenediamine-N,N'-disuccinic acid (EDDS), most preferably present in the form of its S,S isomer, which is preferred for its biodegradability profile. Still other suitable heavy
20 metal ion sequestrants for use herein are iminodiacetic acid derivatives such as 2-hydroxyethyl diacetic acid or glyceryl imino diacetic acid.

Crystal Growth Inhibitors

Non-limiting examples of carboxylic compounds which serve as crystal
growth inhibitors include carboxylic compounds such as glycolic acid, phytic acid,
25 polycarboxylic acids, polymers and co-polymers of carboxylic acids and polycarboxylic acids, and mixtures thereof. The inhibitors may be in the acid or salt form. Preferably the polycarboxylic acids comprise materials having at least two carboxylic acid radicals which are separated by not more than two carbon atoms (e.g., methylene units). Further suitable polycarboxylates include ether
30 hydroxypolycarboxylates, polyacrylate polymers, copolymers of maleic anhydride and the ethylene ether or vinyl methyl ethers of acrylic acid. Copolymers of 1,3,5-trihydroxybenzene, 2, 4, 6-trisulphonic acid, and carboxymethyloxysuccinic acid are also useful. Alkali metal salts of polyacetic acids, for example, ethylenediamine tetraacetic acid and nitrilotriacetic acid, and the alkali metal salts
35 of polycarboxylates, for example, mellitic acid, succinic acid, oxydisuccinic acid,

polymaleic acid, benzene 1,3,5-tricarboxylic acid, carboxymethyloxysuccinic acid, are suitable for use in the present invention as crystal growth inhibitors.

The polymers and copolymers which are useful as crystal growth inhibitors have a molecular weight which is preferably greater than about 500 daltons to
5 about 100,000 daltons, more preferably to about 50,000 daltons.

Examples of commercially available materials for use as crystal growth inhibitors include, polyacrylate polymers Good-Rite® ex BF Goodrich, Acrysol® ex Rohm & Haas, Sokalan® ex BASF, and Norasol® ex Norso Haas. Preferred are the Norasol® polyacrylate polymers, more preferred are Norasol® 410N (MW
10 10,000) and Norasol® 440N (MW 4000) which is an amino phosphonic acid modified polyacrylate polymer, and also more preferred is the acid form of this modified polymer sold as Norasol® QR 784 (MW 4000) ex Norso-Haas.

Polycarboxylate crystal growth inhibitors include citrates, e.g., citric acid and soluble salts thereof (particularly sodium salt), 3,3-dicarboxy-4-oxa-1,6-
15 hexanedioates and related compounds further disclosed in U.S. 4,566,984 incorporated herein by reference, C₅-C₂₀ alkyl, C₅-C₂₀ alkenyl succinic acid and salts thereof, of which dodecenyl succinate, lauryl succinate, myristyl succinate, palmityl succinate, 2-dodecenylsuccinate, 2-pentadecenyl succinate, are non-limiting examples.

Organic diphosphonic acid are also suitable for use as crystal growth inhibitors. For the purposes of the present invention the term "organic diphosphonic acid" is defined as "an organo-diphosphonic acid or salt which does not comprise a nitrogen atom". Preferred organic diphosphonic acids include C₁-C₄ diphosphonic acid, preferably C₂ diphosphonic acid selected from the group
25 consisting of ethylene diphosphonic acid, α -hydroxy-2 phenyl ethyl diphosphonic acid, methylene diphosphonic acid, vinylidene-1,1-diphosphonic acid, 1,2-dihydroxyethane-1,1-diphosphonic acid, hydroxy-ethane 1,1 diphosphonic acid, the salts thereof, and mixtures thereof. More preferred is hydroxyethane-1,1-diphosphonic acid (HEDP).

Still useful herein as crystal growth inhibitor are the organic
30 monophosphonic acid. Organo monophosphonic acid or one of its salts or complexes is also suitable for use herein as a crystal growth inhibitor. By organo monophosphonic acid it is meant herein an organo monophosphonic acid which does not contain nitrogen as part of its chemical structure. This definition

therefore excludes the organo aminophosphonates, which however may be included in compositions of the invention as heavy metal ion sequestrants.

The organo monophosphonic acid component may be present in its acid form or in the form of one of its salts or complexes with a suitable counter cation. Preferably any salts/complexes are water soluble, with the alkali metal and alkaline earth metal salts/complexes being especially preferred.

A preferred organo-monophosphonic acid is 2-phosphonobutane-1,2,4-tricarboxylic acid commercially available from Bayer under the trade name of Bayhibit.

10 **Dispersant Polymers**

Suitable polymeric dispersing agents include polymeric polycarboxylates and polyethylene glycols, although others known in the art can also be used. It is believed, though it is not intended to be limited by theory, that polymeric dispersing agents enhance overall rinsing performance.

15 Polymeric polycarboxylate materials can be prepared by polymerizing or copolymerizing suitable unsaturated monomers, preferably in their acid form. Unsaturated monomeric acids that can be polymerized to form suitable polymeric polycarboxylates include acrylic acid, maleic acid (or maleic anhydride), fumaric acid, itaconic acid, aconitic acid, mesaconic acid, citraconic acid and methylenemalononic acid. The presence in the polymeric polycarboxylates herein of monomeric segments, containing no carboxylate radicals such as vinylmethyl ether, styrene, ethylene, etc. is suitable provided that such segments do not constitute more than about 40% by weight.

25 Particularly suitable polymeric polycarboxylates can be derived from acrylic acid. Such acrylic acid-based polymers which are useful herein are the water-soluble salts of polymerized acrylic acid. The average molecular weight of such polymers in the acid form preferably ranges from about 2,000 to 10,000, more preferably from about 4,000 to 7,000 and most preferably from about 4,000 to 5,000. Water-soluble salts of such acrylic acid polymers can include, for example, 30 the alkali metal, ammonium and substituted ammonium salts. Soluble polymers of this type are known materials.

Acrylic/maleic-based copolymers may also be used as a preferred component of the dispersing/anti-redeposition agent. Such materials include the water-soluble salts of copolymers of acrylic acid and maleic acid. The average 35 molecular weight of such copolymers in the acid form preferably ranges from

about 2,000 to 100,000, more preferably from about 5,000 to 75,000, most preferably from about 7,000 to 65,000. The ratio of acrylate to maleate segments in such copolymers will generally range from about 30:1 to about 1:1, more preferably from about 10:1 to 2:1. Water-soluble salts of such acrylic acid/maleic acid copolymers can include, for example, the alkali metal, ammonium and substituted ammonium salts. Soluble acrylate/maleate copolymers of this type are known materials which are described in European Patent Application No. 66915, published Dec. 15, 1982, as well as in EP 193,360, published Sep. 3, 1986, which also describes such polymers comprising hydroxypropylacrylate. Still other useful dispersing agents include the maleic/acrylic/vinyl alcohol terpolymers. Such materials are also disclosed in EP 193,360, including, for example, the 45/45/10 terpolymer of acrylic/maleic/vinyl alcohol.

Polyaspartate and polyglutamate dispersing agents may also be used, especially in conjunction with zeolite builders. Dispersing agents such as polyaspartate preferably have a molecular weight (avg.) of about 10,000.

A group of preferred clay soil removal/anti-redeposition agents are the cationic compounds disclosed in European Patent Application 111,965, Oh and Gosselink, published June 27, 1984. Other clay soil removal/antiredeposition agents which can be used include the ethoxylated amine polymers disclosed in European Patent Application 111,984, Gosselink, published June 27, 1984; the zwitterionic polymers disclosed in European Patent Application 112,592, Gosselink, published July 4, 1984; and the amine oxides disclosed in U.S. Patent 4,548,744, Connor, issued October 22, 1985. Other clay soil removal and/or anti-redeposition agents known in the art can also be utilized in the compositions herein. Another type of preferred anti-redeposition agent includes the carboxymethylcellulose (CMC) materials.

Builders

The rinse aid used in the compositions of the present invention may also comprise builders to assist in controlling mineral hardness. Inorganic as well as organic builders can be used.

Inorganic or P-containing builders include, but are not limited to, the alkali metal, ammonium and alkanolammonium salts of polyphosphates (exemplified by the tripolyphosphates, pyrophosphates, and glassy polymeric meta-phosphates), phosphonates, phytic acid, silicates, carbonates (including bicarbonates and sesquicarbonates), sulphates, and aluminosilicates. However, non-phosphate

builders are required in some locales. Importantly, the compositions herein function surprisingly well even in the presence of the so-called "weak" builders (as compared with phosphates) such as citrate, or in the so-called "underbuilt" situation that may occur with zeolite or layered silicate builders.

5 Examples of silicate builders are the alkali metal silicates, particularly those having a $\text{SiO}_2:\text{Na}_2\text{O}$ ratio in the range 1.6:1 to 3.2:1 and layered silicates, such as the layered sodium silicates; NaSKS-6 is the trademark for a crystalline layered silicate marketed by Hoechst (commonly abbreviated herein as "SKS-6"). Unlike zeolite builders, the Na-SKS-6 silicate builder does not contain aluminum.
10 Na-SKS-6 has the delta- Na_2SiO_5 morphology form of layered silicate. SKS-6 is a highly preferred layered silicate for use herein, but other such layered silicates, such as those having the general formula $\text{NaMSixO}_{2x+1}\cdot y\text{H}_2\text{O}$ wherein M is sodium or hydrogen, x is a number from 1.9 to 4, preferably 2, and y is a number from 0 to 20, preferably 0 can be used herein. Various other layered silicates
15 from Hoechst include NaSKS-5, NaSKS-7 and NaSKS-1, as the alpha, beta and gamma forms. As noted above, the delta- Na_2SiO_5 (NaSKS-6 form) is most preferred for use herein.

Aluminosilicate builders are useful in the present invention. Useful aluminosilicate ion exchange materials are commercially available. These
20 aluminosilicates can be crystalline or amorphous in structure and can be naturally-occurring aluminosilicates or synthetically derived. A method for producing aluminosilicate ion exchange materials is disclosed in U.S. Pat. No. 3,985,669, Krummel, et al, issued Oct. 12, 1976. Preferred synthetic crystalline aluminosilicate ion exchange materials useful herein are available under the
25 designations Zeolite A, Zeolite P (B), Zeolite MAP and Zeolite X. Particularly preferred is Zeolite A. Dehydrated zeolites may also be used herein. Preferably, the aluminosilicate has a particle size of about 0.1-10 microns in diameter.

Citrate builders, e.g., citric acid and soluble salts thereof (particularly sodium salt), are polycarboxylate builders of particular importance for liquid
30 detergent formulations due to their availability from renewable resources and their biodegradability.

Also suitable in the compositions of the present invention are the 3,3-dicarboxy-4-oxa-1,6-hexanedioates and the related compounds. Useful succinic acid builders include the C5 -C20 alkyl and alkenyl succinic acids and salts
35 thereof. A particularly preferred compound of this type is dodecenylsuccinic acid.

Specific examples of succinate builders include: laurylsuccinate, myristylsuccinate, palmitylsuccinate, 2-dodecenylsuccinate (preferred), 2-pentadecenylsuccinate, and the like. Laurylsuccinates are the preferred builders of this group.

5 Fatty acids, e.g., C12 -C18 monocarboxylic acids, can also be incorporated into the compositions alone, or in combination with the aforesaid builders, especially citrate and/or the succinate builders, to provide additional builder activity.

10 In situations where phosphorus-based builders can be used, the various alkali metal phosphates such as the well-known sodium tripolyphosphates, sodium pyrophosphate and sodium orthophosphate can be used. Phosphonate builders such as ethane-1-hydroxy-1,1-diphosphonate and other known phosphonates can also be used.

ADDITIONAL COMPONENTS

15 A wide variety of other additional components can be formulated into the present compositions. These include: other conditioning agents such as hydrolysed collagen with tradename Peptin 2000 available from Hormel, vitamin E with tradename Emix-d available from Eisai, panthenol available from Roche, panthenyl ethyl ether available from Roche, hydrolysed keratin, proteins, plant
20 extracts, and nutrients; preservatives such as methyl chloroisothiazolinone, methyl isothiazolinone, benzyl alcohol, methyl paraben, propyl paraben and imidazolidinyl urea; thickeners such as hydroxyethyl cellulose, hydroxypropyl methylcellulose, polyacrylamide, and cetyl hydroxyethyl cellulose; salts, in general, such as potassium acetate and sodium chloride; coloring agents, such
25 as any of the FD&C or D&C dyes; perfumes; ultraviolet and infrared screening and absorbing agents such as octyl salicylate; antidandruff agents such as zinc pyridinethione; and optical brighteners, for example polystyrylstilbenes, triazinstilbenes, hydroxycoumarins, aminocoumarins, triazoles, pyrazolines, oxazoles, pyrenes, porphyrins, imidazoles, and mixtures thereof.

30

EXAMPLES

The following examples further describe and demonstrate embodiments within the scope of the present invention. The examples are given solely for the purpose of illustration and are not to be construed as limitations of the present invention, as many variations thereof are possible without departing from the
35 spirit and scope of the invention. Ingredients are identified by chemical or CTFA

name, or otherwise defined below.

Examples 1 through 9 are hair conditioning compositions of the present invention which are used by dispersing in water to make a treated water and applying the treated water to the hair. The treated water can be applied to the shampooed hair.

Compositions of Examples 1 through 5

Components	Ex. 1	Ex. 2	Ex. 3	Ex. 4	EX. 5
Cetyl Trimethyl Ammonium Chloride *1	1.5				2.5
Stearyl Trimethyl Ammonium Chloride *2		1.0			
Palmitamidopropyl Trimethyl Ammonium Chloride *3			2.5		
PEG-15 Stearmonium Chloride *4				2.0	
Polyquaternium-10 *5	1.5	2.0		2.0	
Polyquaternium-4 *6			1.5		1.0
Polyethylene Glycol 1000 *9					
Amino Silicone A *10	1.0				1.5
Amino Silicone B *11		1.5			
Amino Silicone C *12			1.0		
Quaternium-80 *13				0.50	
Suds Suppressant *14	0.15	0.15			0.15
Thickener *15	0.45	0.25	0.50	0.20	0.55
Preservative	0.40	0.40	0.40	0.40	0.40
Water	to make 100%				

Compositions of Examples 6 through 9

Components	Ex. 6	Ex. 7	Ex. 8	Ex. 9
Cetyl Trimethyl Ammonium Chloride *1	1.5			
Stearyl Trimethyl Ammonium Chloride *2		1.5		
Palmitamidopropyl Trimethyl Ammonium Chloride *3			3.0	
PEG-15 Stearmonium Chloride *4				1.5
Polyquaternium-10 *5		0.5		
Polyquaternium-4 *6			1.5	
Polyquaternium-7 *7	1.5	1.0		2.0
Polyethylene Glycol 600 *8	1.0		3.0	
Polyethylene Glycol 1000 *9		2.0		1.0
Amino Silicone A *10	1.0			
Amino Silicone B *11		1.0		

Amino Silicone C *12			2.0	
Quaternium-80 *13				1.5
Suds Suppressant *14	0.15	0.15		
Thickener *15	0.45	0.50	0.40	0.25
Preservative	0.40	0.40	0.40	0.40
Water	to make 100%			

Definitions of Components

- *1 Cetyl Trimethyl Ammonium Chloride: CTAC 30KC from KCl
- *2 Stearyl Trimethyl Ammonium Chloride: Arquad 18/50 from Akzo Nobel
- *3 Palmitamidopropyl Trimethyl Ammonium Chloride: Varisoft PATC from
5 Goldschmidt
- *4 PEG-15 Stearmonium Chloride: Ethoquad 18/25 from Akzo Nobel
- *5 Polyquaternium-10: Polymer LR-400 from Amerchol
- *6 Polyquaternium-4: Celquat L200 from National Starch & Chemicals
- *7 Polyquaternium-7: Salcare SC11 from Ciba Specialty Chemicals
- 10 *8 Polyethylene Glycol 600: Carbowax PEG 600 from Amerchol
- *9 Polyethylene Glycol 1000: Polyethylene Glycol #1000 from Kanto
Chemical Co., Inc.
- *10 Amino Silicone A: BY16-893 Dow Corning Silicones
- *11 Amino Silicone B: XS69-B5476 from General Electric Silicone
- 15 *12 Amino Silicone C: Ultrasil A-100 from BFGoodrich Specialty Chemicals
- *13 Quaternium-80: Abilquat 3474 from Goldschmidt
- *14 Suds Suppressant: TSA775 from General Electric Silicones
- *15 Thickener: Hydroxyethyl Cellulose from Hercules Chemicals

Method of Preparation

20 The compositions of Examples 1 through 9 as shown above can be prepared by any conventional method.

Examples 1 through 9 can be made by mixing the components, as necessary with agitation and elevated temperature. The liquid form composition can be filled into a bottle having a pump providing unit dosage amount of the
25 liquid. Unit dosage amount of this liquid form composition can be filled into a sachet made of plastic film which does not interact with the composition.

The embodiments disclosed and represented by the previous examples have many advantages. The silicone conditioning agents included in Examples 1-9 provide a deposition of 10ppm - 5000ppm, respectively. When released in
30 water to make a treated water, all Examples 1-9 immediately disperse after

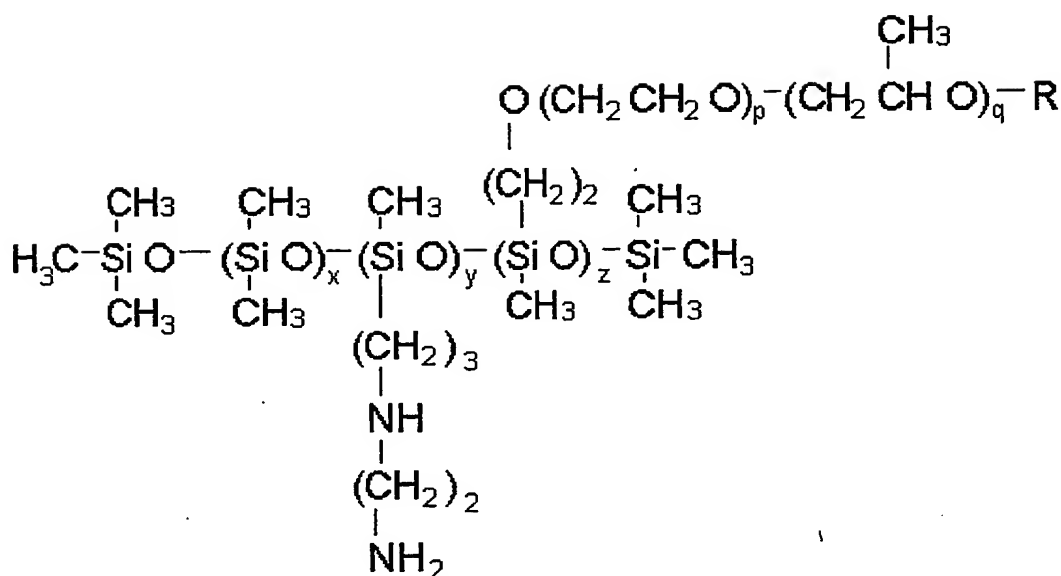
mixing with the hand.

Further, upon and after application to the shampooed hair, they can provide conditioning benefit such as soft and smooth hair feel, easy wet and dry hair coming, and shine.

- 5 It is understood that the examples and embodiments described herein are for illustrative purposes only and that various modifications or changes in light thereof will be suggested to one skilled in the art without departing from its spirit and scope.

WHAT IS CLAIMED IS:

1. A concentrated hair conditioning composition for preparing a treated water having a silicone conditioning agent concentration of 0.001% to 2% for applying to the hair comprising:
 - (1) from about 0.01% to about 20% by weight of a silicone conditioning agent; and
 - (2) an aqueous carrier;wherein the composition is capable of providing a deposition of from about 10ppm to about 5000ppm of silicone conditioning agent when applied to the hair as the treated water.
2. A concentrated hair conditioning composition for preparing a treated water having a silicone conditioning agent concentration of 0.001% to 2% for applying to the hair comprising:
 - (1) from about 0.01% to about 20% by weight of a hydrophilically substituted silicone conditioning agent; and
 - (2) an aqueous carrier.
3. The conditioning composition of Claim 1 or 2 wherein the silicone conditioning agent is dispersible in water.
4. The hair conditioning composition according to any of Claims 1-3 wherein the silicone conditioning agent comprises an amino silicone polyether compound corresponding to formula (I):



(I)

wherein none of p, q, x, y, and z are 0, but are integers that give the compound a deposition property of from about 10ppm to about 5000ppm when applied to the hair as the treated water at a concentration of 0.001% to 2%, and that give the compound dispersability; and R is an alkyl of 1 to 3 carbon atoms.

5. The conditioning composition of any of Claims 1-3 further comprising from about 0.01% to about 50% of an additional conditioning agent selected from the group consisting of mono long-chain ammonium compounds, hydrophilically substituted cationic surfactants, cationic polymers, polyethylene glycols, and mixtures thereof.

6. The conditioning composition of Claim 5 wherein the additional conditioning agent comprises mono long-chain ammonium compounds.

7. A method of conditioning the hair comprising the steps of;

- (a) applying a shampoo composition comprising a deterative surfactant to the hair;
- (b) providing a treated water made by dispersing the conditioning composition of any preceding Claims, wherein the treated water has a concentration of 0.01% to 2% of the silicone conditioning agent; and
- (c) rinsing the hair with the treated water;

wherein steps (a) and (b) may be reversed.

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(71) Applicant (for all designated States except US): **THE PROCTER & GAMBLE COMPANY [US/US]**; One Procter & Gamble Plaza, Cincinnati, OH 45202 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **KOMURE, Natsumi [JP/JP]**; 4-12-404, Narihira-cho, Ashiya-shi, 659-0068 (JP). **SNYDER, Michael, Albert [US/JP]**; 5-15-701 Koyo-cho Naka, Higashinada-ku, 658-0032 (JP).

(74) Common Representative: **THE PROCTER & GAMBLE COMPANY**; Reed, T., David, 5299 Spring Grove Avenue, Cincinnati, OH 45217 (US).

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(54) Title: **CONCENTRATED HAIR CONDITIONING COMPOSITION**

(57) Abstract: Disclosed is a concentrated hair conditioning composition for preparing a treated water having a silicone conditioning agent concentration of 0.001% to 2% for applying to the hair comprising: from about 0.01% to about 20% by weight of a silicone conditioning agent; and an aqueous carrier; wherein the composition is capable of providing a deposition of from about 10ppm to about 5000ppm of silicone conditioning agent when applied to the hair as the treated water.

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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, EP0-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 93 07848 A (PROCTER & GAMBLE) 29 April 1993 (1993-04-29) example I	1-3,5,6 7
A	-----	
X	WO 97 07774 A (PROCTER & GAMBLE) 6 March 1997 (1997-03-06) page 4, paragraph 4	1-3,5,6 7
A	page 7, paragraph 5; claims 1,2; example 2	
A	-----	
A	WO 96 12787 A (JEYES GROUP PLC) 2 May 1996 (1996-05-02) page 5, paragraph 3 -page 6, paragraph 1	1,2,7

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040. Tx. 31 651 epo nl.
Fax: (+31-70) 340-3016

Authorized officer

Saunders, T

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Information on patent family members

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 9307848	A	29-04-1993	US 5277899 A AU 2783892 A CA 2117264 A1 EP 0663813 A1 JP 7500334 T WO 9307848 A2	11-01-1994 21-05-1993 29-04-1993 26-07-1995 12-01-1995 29-04-1993
WO 9707774	A	06-03-1997	BR 9610382 A CN 1193903 A EP 0845975 A1 JP 11511460 T WO 9707774 A1	06-07-1999 23-09-1998 10-06-1998 05-10-1999 06-03-1997
WO 9612787	A	02-05-1996	AU 3704195 A WO 9612787 A1 AU 4394496 A WO 9621721 A1	15-05-1996 02-05-1996 31-07-1996 18-07-1996

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